9 December 1983

MEMORANDUM FOR: Requirements and Technology Acquisition Working Group

25X1 FROM: [redacted] Chairman

SUBJECT: Minutes of 1 December 1983 Working Group Meeting

1. The Requirements and Technology Acquisition Working Group met on 25X1 Thursday, 1 December 1983. Participants included [redacted] 25X1 [redacted] 25X1 [redacted] ISB Executive Secretary, also attended. [redacted]

25X1 2. [redacted] convened the meeting, asking for corrections to the 25X1 minutes of the 3 November meeting. None were noted. [redacted]

25X1 3. [redacted] summarized the report of the Workstation Environment Working Group (WSEWG) presented at the last ISB meeting. Most members of our group had not seen the written report, which 25X1 [redacted] provided to the group. (A copy of the WSEWG report is attached to these minutes for members who did not receive a copy at the meeting.) 25X1 [redacted] also told us that Mr. Briggs would like comments on the report before the 16 December ISB meeting. Our group will not respond as a body, 25X1 but individuals are urged to respond it they wish. [redacted]

4. Lessons from the WSEWG report for our group are as follow: (1) try to incorporate dissenting views in the report; (2) provide cost and impact 25X1 analysis; and (3) keep our report non-technical and easy to read. [redacted]

5. The group then moved on the discuss the Agency's requirements process. The draft report describes the requirements process only as it pertains to ODP. (ODP comprises only about 30 percent of the Agency's ADP resources.) Bob asked the members to write about a one-page description each of how the ADP requirements process works for their directorates, and what are its deficiencies. Our report to the ISB must describe the present system accurately, and in the most complete terms possible, if the report is to be credible. Members will try to get their submissions to Bob by COB 13 25X1 December. [redacted]

25X1 [redacted]

6. The group agreed to present a joint report to the ISB, along with the Information Services Planning Working Group. They felt this approach was appropriate, since requirements definition and validation is an
25X1 important part of the planning process.

7. The next meeting of the working group is scheduled for Thursday, 15 December 1983, at 1030 in Room 4E05 Hqs. The agenda for that meeting, which is scheduled for one hour, is as follows:

a. Approval of minutes of the previous meeting.

b. Miscellaneous old business.

c. Refinement of the requirements process description and
25X1 deficiencies.

25X1

25X1 O/Compt/IHG/ (9 Dec 83)

COMBINING WORD AND DATA PROCESSING IN A SINGLE TERMINAL

AN INTERIM REPORT

Prepared For:

The INFORMATION SYSTEMS BOARD

Prepared By:

The WORKSTATION ENVIRONMENT WORKING GROUP/ISB

16 November 1983

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1. EXECUTIVE SUMMARY

This is an interim report addressing the merits of combining word and data processing (WP and DP) in a single video display terminal (VDT). Recommendations for the near-term can be taken to be final. The section on long-term options, however, contains the initial, tentative, incomplete thoughts of the Workstation Environment Working Group. Firm long-term recommendations will appear in the Working Group's final report.

The Working Group has concluded that WP and DP functionality should be combined in every VDT, but not every terminal need support the entire spectrum of word and data processing capabilities. There are relatively few tasks which are uniquely word or data processing. Most users need both capabilities, and the Working Group expects this to be even more true as time goes on. It is acknowledged, however, that the extent of word and data processing in particular tasks varies. This points to the need for a hierarchy of standard terminals, each having a somewhat different blend of capabilities.

A number of problems with the current ADP situation in the Agency have been identified. No one VDT available to Agency users provides true automation of the desk-top environment. Incompatible data terminals, word processors, and personal computers (PCs) are proliferating. A robust collection of capabilities has been developed for Office of Data Processing (ODP's) timesharing mainframe computers. But a single, user-friendly interface to them does not exist, and interfaces between capabilities are difficult to establish and maintain. The Agency's capability to train users is inadequate and is exacerbated by the lack of a single entity responsible for the planning and implementation of a training program. This situation is serious and deserves immediate attention. It should be addressed with adequate resources orchestrated by active customer involvement.

The Working Group examined a variety of options for correcting these problems in the near term (during the next five years). Of these, it recommends that three be pursued, each in concert with the others:

1. Continue to devote the resources required to provide file transfer between WANGs and the IBM mainframes. In addition, make WANG Alliance terminals interactive with these mainframes.

2. Allocate additional resources to improve Host-Based Word Processing, providing as much WANG-like functionality on the Delta Data terminal as possible. Such a move should halt or at least reduce the unchecked spread of WANGs and at the same time ameliorate the incompatability problems.

3. Meet new terminal installation requirements with commercially available PCs. These could fill in the functional gaps the Working Group has identified, and also would allow the Agency to take advantage of the plethora of commercial software written for PCs. The cost comes in the form of large-scale interfaces to the mainframes. The Working Group believes that this last option is likely to play a big role in its recommendations for the long-term.

2. PURPOSE

The Workstation Environment Working Group has been tasked by the Information Systems Board (ISB) to determine the feasibility of combining word and data processing in a single video display terminal (VDT).[1/] The VDT is to be located in a workstation designed to accommodate, to the degree possible,[2/] human factor and environmental criteria. The purpose of this paper is to inform the ISB of the Working Group's initial findings, as well as to provide recommendations for the Board's consideration. In addition, the paper is intended as a means to communicate ideas with other ISB Working Groups. Further, the ODP will be preparing an RFP for a VDT to replace the Delta Data. Some of the findings and recommendations presented in this paper should provide input to the RFP.

3. SCOPE

Notwithstanding that this is an interim report, sections 2 through 7 inclusive are looked upon as being complete, and the near-term recommendations final. The long-term recommendations, however, were drawn from a preliminary examina-

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1/ The international scientific community has adopted (informally, at least) a convention of referring to a computer system as the central procesing unit (CPU) plus requisite software commanded via a video display terminal (VDT), which in turn can be supported by a variety of peripheral equipment. The immediate environment in which a VDT is used is known as a workstation. The commercial literature rarely makes these distinctions, leading to a certain confusion on the part of the buying public as to which term refers to what. The Working Group has found it useful to follow the lead of the scientists, and recommends that the Agency do likewise.

2/ Appendix A addresses this issue to some extent.

tion of limited information, and the results reflect this restricted view. There is much work to be done before the Working Group members will feel at ease in proposing long-term recommendations. They will appear in the Working Group's final report.

In addition, the focus of this report has been intentionally biased toward mainstream ADP. Advanced technology capabilities in image and voice processing -- although each a promising feature even at this embryonic stage of development -- are treated more or less in passing simply because they sit so close to the fringes of technology.

Lastly, for a variety of reasons, automation requirements for overseas sites have been excluded altogether.

4. METHODOLOGY AND APPROACH

The views expressed in this paper are those of the members of the Working Group and are based solely on their knowledge and experience. The report is not presented as a coordinated, intercomponent position paper.

There was neither time nor a perceived need to conduct a comprehensive survey of CIA data and word processing VDT users to solicit and report their views. Neither was a zero-based requirements study considered necessary. Earlier research has firmly established VDT requirements, and experience with the present generation of VDTs has identified both their strengths and their shortcomings. There is abundant information available on which to base an answer to the question of whether WP and DP functionality ought to be made available in a single VDT.

Working Group members represent a reasonable cross-section of personnel concerned with workstation research, design, and evaluation. Many have been associated with development of the DP and WP requirements in the Agency, have served on evaluation and selection groups, and have been involved in the procurement and installation process. Moreover, most of the Working Group's members use DP and/or WP daily in the conduct of their duties. They have experienced many of the frustrations felt and reported by other users. And perhaps most importantly, their enthusiasm for automation has been tempered by the technical constraints and practical limitations that tend to stand in the way of providing each and every feature anyone will ever want in a system.

During the brief course of its existence, the Working Group has had the benefit of a number of briefings and several papers by Agency and other experts on subjects pertinent to its deliberations. Included have been such topics as the

Golden Tiger effort in the DI, host-based word processing, the future of the Delta Data terminal, and information systems security considerations.

It was determined that while the Working Group must consider all relevant technologies, it should focus its near-term attention on that which is practical and can be achieved early-on. Unbridled "blue-skying", it was felt, would lead to unacceptable delays, unrealistic expectations, and dissatisfaction among users when all of the desirable and "nice-to-have" features fail to materialize, as is inevitably the case. It is, therefore, the intent of the Working Group to make only recommendations that can be achieved within the current state-of-the-art in VDT and systems technologies. This does not exclude the very real possibility that custom-coded software may have to be developed to provide the desired functionality and interfaces with mainframe systems.

This report addresses four types of capability for which there appear to be firm requirements throughout the Agency. They are:

- Stand-alone data processing

- Stand-alone word processing

- On-line data processing

- On-line word processing.

For the purposes of this paper, these capabilities are defined in terms of VDTs that can provide them. Stand-alone data processing, therefore, refers to the capability to perform data processing functions in a purely local environment without connectivity (or without utilizing the connectivity, if it exists) to a mainframe computer or to a local area network. A personal computer is the best example of a VDT providing a stand-alone data processing capability. Likewise, stand-alone word processing is defined as the ability to create and edit text on a local, self-contained VDT, without dependence on any external hardware or software. The WANG WPS 20 and NBI System 3000 are examples of devices that provide stand-alone word processing capabilities. The addition of word processing software to a personal computer makes it qualify also as a stand-alone word processor. On the other hand, VDTs that depend on software in the mainframe computer (or in a local CPU that serves more than one VDT) can be thought of as providing on-line data or word processing capabilities. The Delta Data 7260T is a device that permits both. It is normally used as a data processing terminal but, through a combination of software located in the mainframe computer and its own internal capabilities, it can provide on-line word processing. To carry the personal computer example a step further, it can be tied to a mainframe and used as an on-line VDT.

5. CURRENT SITUATION

a. Description

The terms "word processing" and "data processing" have multiple definitions. Recognizing that the distinction made here is by no means absolute, word processing is defined as the manipulation of (primarily) textual data for formatting purposes, whereas data processing is viewed as the execution of a systematic sequence of operations performed upon (primarily) numeric data. In other words, the two processes are differentiated along the lines of textual formatting vs. mathematical operations. Graphics capability is viewed as a separate feature only in terms of the sophistication it requires of a particular device; in all other respects it is considered as an integral part of both word and data processing activities. The Working Group recognizes that day-to-day activities on a terminal can involve some combination of the three.

When these several processes are examined at the level of the VDT itself, one finds that terminals designed mainly for DP applications tend to be attached to a host processor, often by means of a sophisticated communications link. The current generation of powerful personal computers (PCs) is an exception to the rule. The WP terminals, on the other hand, usually store and manipulate data internally; they are not yet known for their support of host connections.

This state of affairs is easily understandable when it is recognized that WP companies themselves have had very little DP background. Word processors began as business machine replacements for electric typewriters, not as a part of the DP industry. As late as 1979, few WP vendors marketed VDTs with communications capabilities; a host connection was not necessary. Now almost all of them have completed development of some limited communications protocols.

A third element of the evolution involved the development of the PC for the small business and home entertainment markets. Word and data processing capabilities were combined in the PC in the form of software packages which were developed to supply both capabilities. The advent of office automation has included such software capabilities as electronic mail, folder management, and calendar management, and has increased the software capability of the systems. Yet such features have not altered significantly the WP terminal.

The Agency currently possesses all three in many forms. The Agency standard DP terminal is the Delta Data 8260, and the standard WP device is the WANG. There is as yet no recognized standard PC, though there are a number of them available under Agency contracts, including both the Delta Data 8365 (new PC) and the WANG PC. At last count there were nearly 2500 Delta Data devices and at least 2800 WANG terminals installed (see Figure 1). Appendix B gives the detailed list of all VDTs which are currently housed in Agency facilities.

The Delta Data VDT is a sophisticated DP terminal which currently implements WP primarily by virtue of software packages resident in the attached host, e.g. Host Based Word Processor and SCRIPT. Though there is capability to do some WP in the terminal itself, the software project to support it was abandoned in favor of the implementation of modifications to support the SAFE project. Given the resources, the requisite software could be developed, as the Delta Data is a customized VDT. But justification for such development at this point in the Delta Data's life is questionable. The Delta Data VDT, because of its customized development, runs a non-standard protocol implemented totally in software. Several large projects have developed software dependence on the use of that protocol, including all GIMS applications (CAMS as well), and SAFE.

The WANG terminals, originally stand-alone word processors, now possess limited capabilities to support DP applications. Unfortunately, this capability will not satisfy the requirements of several large scale Agency developments. For example, both the SAFE and CAMS2 projects are being written using VDT capabilities which the WANG cannot support (split screen being the most obvious). It must be recognized that WANG is part of a commercial product line, not an Agency custom device; accordingly, limited development can be undertaken with WANG. Third party vendors are already offering modifications for the WANG, but product line compatibility and licensing arrangements could pose problems with this approach. On the other side of the coin, WANG offers the advantage of running in a distributed mode. For offices handling compartmented information, WANG can offer some mixture of data processing and word processing services while preserving compartmentation.

b. Perceived Problems, Inadequacies, Concerns, and Basic Perceptions of the User Community

The Agency user community looks at word and data processing terminals as outdated, costly, inefficient, unintegrated, too large, too noisy, creating too much heat, and being too hard to learn to use. The VDT and the system

being accessed are often not separated in the user's perception, so systems with complex command syntax, complicated menu or forms, slow response times or continuous interruptions of service add to the negative view of the Agency's automated support.

To compound the problem, there is a noticeable lack of trust on the part of the users' ADP representatives towards the system for establishing requirements and selecting VDTs. A comparison of the last set of DP terminal requirements for the Delta Data 7260 (over which so many labored for so long), offers convincing evidence that requirements documentation need not result in a VDT that meets user needs. One case in point is the split screen display. The goal was to allow users to compare two documents or sets of data on a single screen. The solution is a display containing so little data at one time as to make comparisons meaningless for anything other than rudimentary data entry.

Then the latest version of the WANGs came up a tad short of expectations in the area of telecommunications. Not only could it not communicate with ODP; it turned a blind eye to other WANG networks as well. Then there was, and continues to be, the problem of standardized record keeping. The clerical community is not yet fully aware that the WANG can be programmed (either by the user or by at least 20 specially prepared off-the-shelf programs) to handle just about any of the Agency's myriad of forms. Conventional wisdom still clings to the belief that conventional typewriters must be used for filling in the little boxes on the forms.

The bottom line? Data terminals, word processors, and personal computers proliferate, no one dares turn in a typewriter, per capita floor space is shrinking at an alarming rate and can no longer support all of this collocated hardware.

(1) Functional Gaps:

No Agency VDT -- stand-alone or on-line -- provides a true automation of the desk top environment. None meets the collective needs of managers (MIS, Pert Charts, Calendars), analysts (data processing and manipulation, correlation of text and graphics, modeling, drafting of intelligence items, mail), clericals (word processing, bulk data entry and retrieval and mail) and data processing professionals (programming). It is not at all uncommon to use several different VDTs to complete one task using the same data or files (data input on the 7260T; data output on the Tectronix).

(2) Functional Overlap:

The myth that "word processing" terminals are separate and distinct from "data processing" terminals has been well promulgated by VDT vendors. The simple truth is that any combination of capabilities and functionality can be combined in the same terminal, a fortunate state of affairs since in the long run relatively few tasks are uniquely DP or WP. True, any one task may be geared toward either DP or WP, but most users eventually need both capabilities to complete their tasks. To limit a VDT to either word processing or data processing is a very expensive price to pay for office automation. In today's complex work environment, desk top automation must provide on-line access to graphs, charts, text, tables, and in the not-too-distant future, imagery.

(3) Training

From the user's point of view, an on-line VDT and the central processing unit (CPU) supporting it are inseparable -- they are praised or condemned as one. Learning to use a VDT mandates learning to use the systems to which it interfaces. If the user interfaces are unnecessarily complex or if VDTs that access multiple data bases/systems use identical commands to execute totally different functions, users begin to feel that they will never be able to learn how to use the VDT. When it's necessary to attend a series of one and two week courses in order to learn how to operate the various systems the VDT accesses, managers understandably begin to resist training for their staffs. Users get so bedeviled by the idiosyncrasies of the various applications that they end up using only those which they absolutely must use to complete their tasks, leaving other (perhaps more appropriate) systems gathering dust. System upgrades, too, usually have an adverse impact on the user population, which sometimes is required to take additional training in order to fathom what these changes have wrought. There is virtually no adequate on-line training, computer aided instruction, or HELP program. More is being added, but the level of on-line help is not consistent across applications. Commands are not intuitive, and often manuals are not well indexed. The customer services personnel are more than helpful when called upon for assistance, but if the user interfaces were better developed, such calls would not be needed as frequently as they are.

As matters now stand, there is no single focal point concerned with formulating across-the-board ADP

training requirements, nor is there a systematic means for satisfying the requirements were they forthcoming. The Working Group views the situation with alarm, and strongly recommends that immediate attention be devoted to the Agency-wide training requirements of the computer novice, as well as the experienced users confronted with new or enhanced hardware and/or software.

(4) Cost

Cost is a relative factor. The purchase or lease price of a room full of VDTs most assuredly will capture the attention of a component's Budget and Finance Officer. But that cost pales in comparison to the development and purchase costs of the software necessary to support an organization with interests and requirements as diversified as those in this Agency. To truly exploit the capabilities of automated mail (AIM), on-line composition (Script, EZPUB, AIM, HBWP), and electronic creation, dissemination, receipt and storage of cable traffic (SAFE, AllStar) requires that the majority of Agency personnel have ready access to and know how to use appropriately supported VDTs. The idea of on-line mail is hardly cost-effective if only a few have electronic mail boxes!

There is no question that cost/functionality trade-offs are important, but the Working Group perceives a long-standing imbalance favoring cost-cutting measures. What the Working Group would like to see is a more balanced assessment wherein the users have a greater voice in deciding what computerized capabilities will best satisfy their needs. This may not come about until the direct costs of office automation are removed from component budgets or supported more vigorously than they have in the past.

(5) Space

The issue of space is one that has been beaten to death here at the Agency. There is simply none to spare. VDTs and their related equipment must fit into an already overloaded work environment. With some of the directorates having the goal of one terminal per employee, a way must be found to fit the new equipment into the existing workspace, a task exacerbated by the fact that the current stand-alone configuration of word and data processors and their peripheral equipment requires a truly large "footprint."

(6) Installation and Relocation

The current data and word processors impose configuration and location constraints making it difficult to plan office floor space based on business or communication requirements. Flexibility in environmental design is next to impossible. Installation and relocation procedures are a nightmare. Not only is there a backlog for physical receipt of the VDT, but for the moment there is an additional 4 or 5 week wait after the VDT is hooked up before it is actually connected to an ODP line. The current grid system may preclude placing the VDT where the user needs it, with the result that wires and boxes are under foot or in otherwise hazardous locations. It is not unknown to have the physical layout of the work area revamped to accommodate the installation. Work disruption is another factor; there are at least 2 or 3 visits from various crews comprised of several workmen with their ever-present security escorts (they'll often outnumber the occupants). And God forbid an already automated office should reorganize! Let the record show that at least one Agency component has the distinction of having allocated space on the basis of where the terminals were positioned rather than on the logical placement of the staff. (SAFE tried to install a communications link that would help eliminate some of the problem by having "drops" from a separate system installed in the ceiling; however, this system can not be utilized.)

(7) Electronic Emanations

TEMPEST requirements clearly restrict acceptance of commercially available word and data processors, although most of them can meet the specifications one way or another (including shielding entire buildings) if the buyer is willing to underwrite the costs for doing so. The Working Group simply calls attention to the need for an Agency policy on this matter, especially as the components located outside the Headquarters compound prepare for office automation.

6. DESIRED SITUATION

a. WP and DP Combined

This section defines the working environment recommended for future Agency office automation. It also answers the question posed by the ISB to the Working Group: should word and data processing be combined? The response: Yes, combine WP and DP functionality in every VDT, allowing for the fact that not every terminal need support the entire spectrum of word and data processing capabilities.

The Working Group was able to justify its position on several grounds. One had to do with the fact that it could not operationally define word and data processing in any manner that clearly distinguished these two functions (see Section 5a).

Another, perhaps more compelling reason for the recommendation, had to do with the Agency's time-honored modus operandi. The CIA was and continues to be an information factory. Not so many years ago, raw information was processed into useable intelligence for the national policy makers by a manual system of collection, storage, retrieval, analysis and dissemination of data (in the generic sense) -- paper and pencil word and data processing, as it were. Computers sped up the process, allowing the analyst to tap and manipulate more and deeper pools of data, but the underlying analytic process remained essentially the same. The question behind the question raised by the ISB is whether the Agency should continue to merge the functions of retrieval and analysis of data with the production of its products (reports, cables, etc.) now that it has entered the next level in automation. The general feeling is "but of course." No one has come up with a compelling reason for change.

Past history aside, there is the matter of future trends that also makes this merger important. Some time ago the world crossed the threshold of an information explosion. The Agency, no exception to the rule, has first-hand experience in coping with more information than anyone would have dared forecast a decade ago, and there's every reason to expect this trend to continue. Accordingly, the Working Group sees no alternative to the merger of complementary word and data processing in the Agency's efforts to analyze and report on world events for the national decision makers. As a matter of fact, a strong argument can be made for adding graphical analysis and reporting procedures and imagery display capacity as integral parts of word and data processing.

b. How to Achieve That Goal

The Working Group finds it difficult to imagine how word and data processing and graphical functions can be effectively merged so long as the current dual-track approach to office automation is allowed to continue. Each passing day sees more terminals being connected to the IBM mainframes while separate crews install stand-alone WANG and NBI word processors (see Figure 2). The Agency (like most large mainframe computer users) finds itself in this position because it could not respond fast enough to

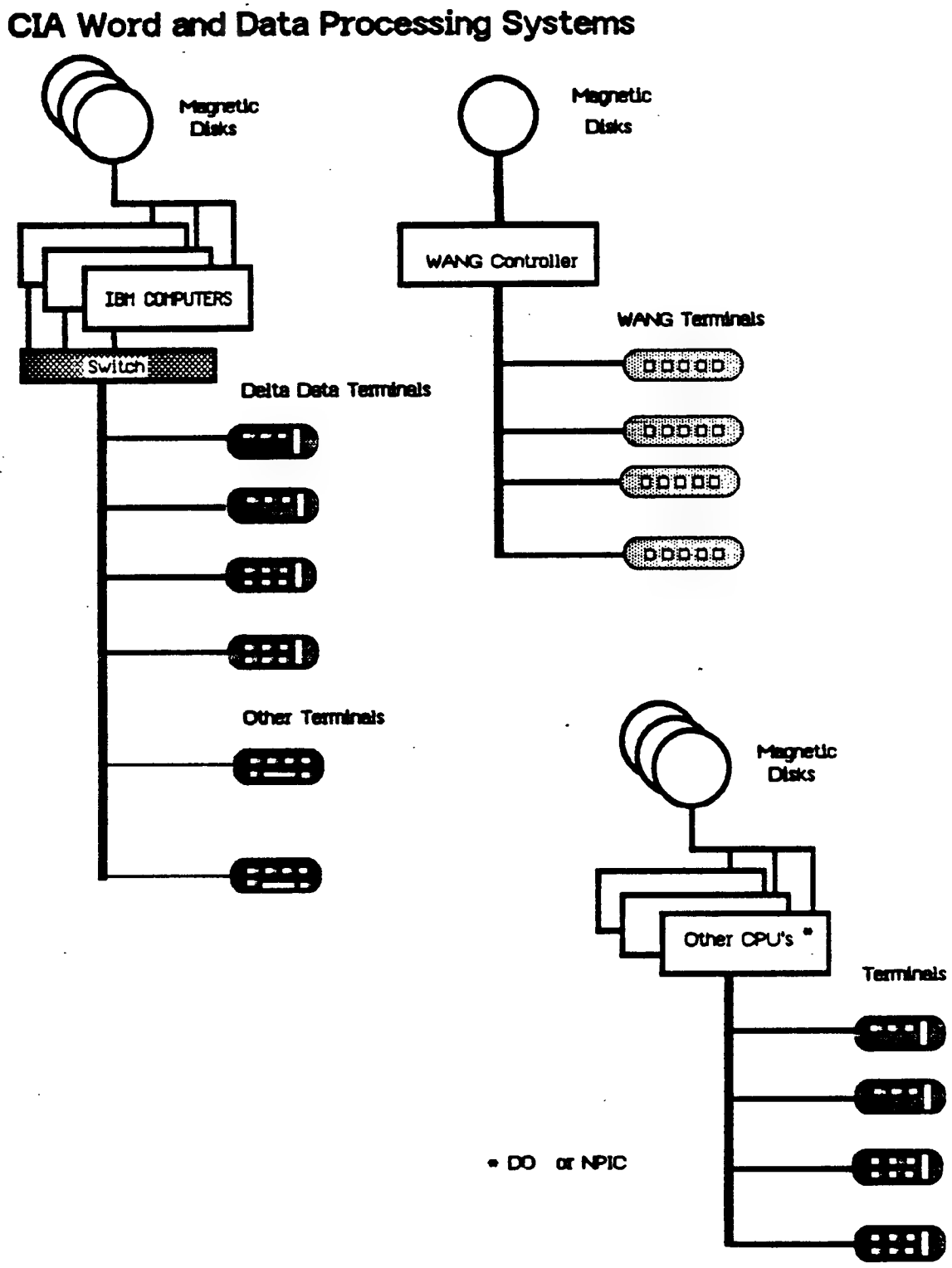

FIGURE 2

technology that permitted the mini- and micro-computers to take hold of the stand-alone word processor market. This situation can be temporary, but it can only be corrected with adequate resources directed by good customer input.

The goal can be met by hardware modifying the current software environment during the near term, and by defining the best requirements for long term implementation. To understand the proposed solution, the future environment must be outlined. It will be described here from a user's point-of-view, but be aware that the entire computing system is affected by this environment. Significantly, the ultimate solution involves a fundamental change in the Agency's computer architecture, away from a centralized computing and file-server system, toward a decentralized computing base retaining the centralized file maintenance function. It may be only small consolation, but this solution is not unique to CIA; it is a world-wide trend in how large computer complexes work.

c. Near Term Options

The near-term desired situation is to have some connectivity between the WANG and IBM systems. This would help close the gap between the two processing environments the Agency is developing. Such integration is defined in Section 7.

d. Long Term Options

This situation is too complex to treat in detail with the limited time the WSEWG had to apply to the problem. Section 8 merely sketches the options. The desired situation is a small family of hierarchical VDTs, each having the general functions of those below it -- plus special functions tailored to particular job groups. The WANG terminals would be replaced by a member of this VDT family, depending on the functions that the user performs most often. ODP would be well advised to plan on the assumption of one terminal for nearly everyone in the Agency.

7. NEAR TERM OPTIONS

a. Individual Options

Near-term is defined for present purposes as lasting through 1988. Recognizing that the half-life of computer technology is measured in a matter of months, it is not unreasonable to expect more than one technological step forward during the near-term. If for no other reason, the Working Group views the next five years as a truly

exciting transition period. Consequently, whether the approaches examined here or alternatives emerging from other sources end up as Agency policy, the Working Group implores the decision makers to reach for that delicate balance between near-term expediency and careful, long-term planning. Interim solutions must not be allowed to stand in the way of what will best satisfy the future needs of the Agency.

With this philosophy guiding Working Group deliberations, the following options emerged. None represents quantum leaps in technology. Each shares the status quo as a common point of departure; all make at least some allowance for future flexibility. And finally, the several options should be looked upon as being distinct from one another. Each stands as a separate entity. The Working Group's recommendations appear after the several options are described.

(1) Maintain Present Heading

Allow the dual-track approach to continue for the time being, while marshalling the resources to concentrate on long-term options. In other words, provide Delta Data and/or WANG terminals to satisfy individual needs as required and on a case-by-case basis. Meet special purpose needs, such as graphics, with specialized terminals and software.

(2) Minimal WANG Connectivity

Continue to devote resources to provide minimal connectivity (i.e., file transfer) between the WANGs and the IBM mainframes. In addition, make the WANG Alliance terminals interactive with the mainframes, recognizing that only a subset of the available interactive functions will be accessible.

(3) Delta Data On-line WP (HBWP)

Allocate additional resources to improve Host-Based Word Processing (HBWP) so as to offer as much WANG-like WP functionality as possible in the Delta Data. At the very least, this would reduce the number of WANGs being brought on board, a necessary first step toward resolving the dual-track dilemma. It would also greatly facilitate the receipt, editing, creation and transmission of cable traffic, which collectively appears to be one of the most pervasive near-term needs speaking in favor of combining DP and WP capability in a single terminal.

(4) Delta Data Stand-alone WP (On-line DP; Stand-alone WP)

Provide a complete stand-alone (off-line) WP capability in the Delta Data. This option would permit use of the Delta Data as both an on-line data processor and an off-line word processor. Unfortunately, it would not address the cable processing requirement to the satisfaction of Operations and Intelligence Directorates.

(5) Delta Data Personal Computer (PC) [HBWP; Stand-alone WP + DP]

Create a Delta Data fully capable of serving as a host-based word processor, a stand-alone word processor, and a stand-alone data processor. It would then serve as a personal computer and word processor, as well as an on-line DP and WP terminal. It would require disk drives, operating system software and applications software for the stand-alone configuration, along with an enhancement of the HBWP (perhaps to the point of equating it to the capabilities of the stand-alone WP software). This would be an ambitious effort; it has failed once already. It may well be that a plan of this magnitude cannot be justified as a near-term solution.

(6) Commercial PCs (On-line and Stand-alone WP + DP)

Meet new terminal requirements with commercially available PCs. They would offer all of the capability cited in Option 5, plus have the added advantage of nearly limitless availability of applications software. Note that this option is burdened with several unique costs. One is that Agency resources would have to interface the PCs to the mainframes (presumably a smaller effort than would be required for Option 5). Secondly, it brings closer the day when the Agency must deal with the issue of institutional (bulk) vs. individual purchase of off-the-shelf software, and the related matter of licensing agreements if and when software and/or hardware is to be modified.

On balance, this option has some appeal. Were there available the software to allow several PCs to emulate the Delta Data, the Agency would at once have some control over which PCs are selected. Absent any PC policy, an increasing number of brands (most not TEMPESTED) are materializing all over the Agency (recall Appendix B3.)

b. Combined Options

(1) Options 3 + 4 + PCs for DP

Configure the Delta Data as an on-line and stand-alone word processor. Stand-alone data processing requirements would continue to be met by PCs.

(2) Options 5 + 6

Maximize the on-line and stand-alone WP and DP capabilities of Delta Data, filling gaps with PCs.

(3) Options 2 + 3 + 6

Merging the capabilities described in Options 2 + 3 + 6 would offer some relief to those already committed to WANGs and Delta Datas, and permit the newer ADP converts to carry out their data and word processing on PCs. Such a stopgap configuration offers most (certainly not all) of the capabilities promised by the next generation of terminals. It should be especially welcomed by those now clamoring for both on-line and stand-alone DP and WP in the same terminal.

c. Recommended Approach

It is recommended that Options 2 + 3 + 6 be adopted as the near-term solution to the Agency's word and data processing terminal requirements. The recommendation is felt to be justified on a sound cost/benefit basis. The combination of the several options provides for incorporating both DP and WP functionality in existing workstations, avoiding a costly near-term terminal replacement program. It offers early assistance to Delta Data users and addresses the stated desire for some connectivity between the WANG and IBM systems to help close the dual-track gap. It also introduces PCs into the inventory in a rational, controlled manner. The approach is consistent with what the Agency's strategic ADP direction ought to be. That is, provide a family of workstations with capabilities ranging from simple word and data processing to full on-line and stand-alone WP and DP operations, graphics capability, and image processing. If resources cannot be made available to implement all of the functions implied here, then Options 3 and 6 would provide the greatest payoff. If only one near-term effort can be mounted, it should be Option 3. As indicated above, some version of Option 6 is likely to be incorporated in the long-term recommendations of the Working Group.

8. LONG TERM OPTIONS

a. Background

Time slipped away before anything approximating a systematic assessment of long-term needs or recommendations could be carried out. So what is found here is a disjointed collage of first impressions -- hardly more than thought provocations -- sent along if for no other reason than to show that the Working Group stared at if not looked into an admittedly difficult task. The Working Group begs the Board's indulgence, promising to address the long-term situation in its final report.

b. Perspective

The use of multisource materials in day-to-day analyst activities has forced the need for capabilities to display and manipulate this information. Developing "long term" options to meet these requirements is difficult since the end user's materials and analytic skills, methods and procedures continually improve while the technology itself is racing ahead at a rapid pace. Advances on one front often impact on the other. Is it any wonder that technical forecasting is as much an art form as it is a hard science? For this discussion "long term" will mean the transition away from a strictly text display device (e.g., Delta Data terminals) to a local station capable of handling display of text, graphics and imagery, and with a computational power available for analysis. A reasonable timeframe for this transition seems to be 1987 and beyond.

c. Options

As analysis of information becomes more complex, the tools available to an analyst must improve in kind. This improvement should be in three areas -- word processing, data processing and image/graphics processing.

The greatest strides during the past few years have been in word processing and graphics manipulation capabilities. This trend is expected to continue. The thrust of activity here has been in developing "user-friendly" systems such as the Xerox Star System. Bit map display technology has led to an "electronic office" environment where word processing has been expanded to mean electronic file cabinets, electronic mail (both text and voice), ICON graphic displays and local processing power.

Even though interactive word processing with graphic editing and display capabilities have been the fastest growing area of technical improvement, the field is now

begging for improvements in image presentations and the use of artificial intelligence for system automation. Analysts are already requiring tools to perform temporal and trend analysis, data reduction, multidiscipline data fusion and access to multiple data bases. What is needed and needed now, is technology to perform these analyses and to display the results in a single VDT in a way which improves rather than interferes with the daily work flow.

The concept of an advanced VDT is a total work environment built around an individual. This paper concentrates on the VDT sitting in the middle of that environment, a device to tie together communications, memory, processing power and artificial intelligence. The requirements for this device include:

(1) Equipment

It's finally a buyer's market. Any number of systems are available at various levels of local processing power. The Xerox 1100 series, Sun Microsystems, Apollo, PERC, Apple LISA plus others are aiming their product at the office user. Future system improvements will include a multi-level bit map display to improve the quality of graphics and images. Voice input/output (I/O) should become more integrated into these as the interfaces and data bases become smarter. The explosion of multiwindows for display should settle down into a system which has discrete windows, each controlling separate processors or activities. The area of biggest change to be expected is in degree of local processing power and computer language support. There is currently a race to increase computer power from 8-bit processors to 32 or even 64 bit processors. This is also being complemented by an array of languages including specialized word processing packages and local processing languages such as 'C', smalltalk and many dialects of LISP. A shakedown appears necessary but not imminent.

(2) Communications and Storage

The capability to display text, graphics and imagery requires new technology in order to store and/or transfer a large volume of data to and from various users and data bases. Text-only systems can get along with far smaller bandwidth networks than imagery and graphics systems. Even though bit compression schemes are being developed to reduce the amounts of bits per pixel, there is an inevitable trade-off between image quality and amount of compression. Studies have shown that image displays require at least 3 or 4 bits per pixel for a suitable

image. Synthesized voice messages, similar to WANG's voice electronic mail system, will also require an expanded bandwidth throughout the network.

In parallel to this is the requirement to retain all of this information in data bases and local/remote memories. An advanced VDT will require downloading of information to a local processor from a distributed relational data base (as an example). The local processor will allow the analyst to do local processing on globally available information at a high response rate -- display and modify the results -- and distribute the results back to the network.

Current networks being implemented have transmission rates from 56 kilobits up to 1.54 megabits per second to achieve 3 second response times for imagery retrieval. As the number of users increase and data bases grow, new communication architectures will be needed. The local area network (LAN) is the generic solution to these requirements. Development of such a LAN must progress quickly, however, if there is any hope of designing the necessary interfaces into the next generation of terminals.

(3) Artificial Intelligence (AI)

The greatest gains in the ability to improve the productivity of the intelligence community's analysts will be through the incorporation of AI techniques into the VDT. Analysts need to be able to compare information on current activities to past events looking for trends and/or contradictory information. An AI system can act as the local "historical expert" and provide for a conversation flow between the user and the system. What is even nicer is that the AI system can obtain its information from more than one analyst and correlate the results.

d. Recommendations

(1) Develop multi-windowing display device with keyboard, pointing device, and voice I/O.

(2) Provide the software to support the simultaneous display of text, imagery and graphics. Imagery should be displayed with 3 to 4 bits per pixel as a minimum.

(3) Local processing capabilities should be variable, depending upon the user. For example, the low end may be an IBM PC interfaced to the network, whereas the high end may be a Xerox 1100 series or SUN micro-

processor system. This hybrid integration of capabilities would support the secretary up to the analyst, and also provide for the occasional high performance stations, as required.

(4) Select state-of-the-art technology for network communications and information storage. This may require additional R&D into communication architectures and optical disk storage.

(5) Today's systems -- the Xerox 1100 series, SUN, PERC, Apple LISA, and IBM PC -- are excellent candidates on which to prototype new capabilities and demonstrate their efficiencies. It is still very unclear how these systems will scale up into operational systems. The questions of both hardware and software expandability need to be addressed.

APPENDIX A

By the early- to mid-1970's, European scientists were trying to cope with a spate of reports that VDTs could be hazardous to the user's health. Visual, musculoskeletal, emotional, health and safety problems were being reported on a global scale by VDT users who interacted with their systems on an extensive daily basis. Meanwhile, American scientists were busy responding to alarms of potential ionizing and nonionizing radiation emissions from VDTs.

There's far less hysteria in the user community today. Although it will be at least another five years before the scientists will begin to relax, some general conclusions can be drawn despite the fact that the technical literature is still as long on speculation as it is short on definitive results in terms of many aspects of VDT use. For example, NIOSH has repeatedly stated that VDT operators are not being exposed to hazardous levels of radiation. Indeed, the Americans are now much more interested in research topics once limited to Europe. Articles on the interrelationship of job stress and work task design issues are clearly in vogue in the domestic literature.

A fairly extensive review of the human factors literature suggests that 13 often overlapping subject areas have been addressed by the scientific communities both here and abroad (Table 1). Not all of the results are in, by any means, but at least there is a point of departure for discussions on how to design and use VDTs for data and word processing. Somewhat less attention, thus far, has been given over to VDTs designed for image exploitation. The Working Group strongly urges the system designers and Agency management to address these issues long before a final decision is made on system configuration.

As a case in point, there is reason to believe that there are at least three types of VDT users: data entry, clerical, and professional. Associated with these classifications are such variables as: amount of time per day spent at the VDT; the type and level of control the system has over the user's activities; keyboard arrangement; and general workstation layout. These variables, in turn, have been shown to have a measurable and differential impact on the several types of users.

As a worst-case example, compare the workstation requirements of a 50-year-old data entry clerk to those of a 25-year-old analyst. There's a good chance that the clerk will be wearing glasses, probably bifocals. That means that the table and chair have to be adjustable such that the screen will sit low relative to the line of sight so that the clerk can view the screen through the "reading" (bottom) portion of the glasses. Otherwise, the clerk will be forced to assume the classic head-back, nose-in-the-air position characteristic of the bifocal community. The screen had better not be much more than 12" to 18" away, either, because the characters will be too small to read.

The keyboard probably should be detachable, and all paperwork has to be displayed at less than arm's reach (again, about 12" to 18"). Since the clerk will be viewing the screen six to eight hours per day, glare, image characteristics, contrast and general illumination must meet human factors specifications. If they don't, visual problems (asthenopia, or eye strain) are a certainty. Locked to the chair, the clerk will be more sensitive to temperature, humidity, and airflow than someone who can get up and move about at will. A numeric keypad may be required for large volumes of numeric input, and a decision will have to be made as to whether it will be arranged as per the telephone or calculator configuration.

Add to this the fact that a system designer/manager with nary a day of clerical experience designed the system to satisfy the stringent demands of the computer. User-related information filtered up to his/her desk through uncountable layers of bureaucracy. Of course, in order to maximize efficiency, the clerical's tasking was reduced to a rigid, monotonous, production-oriented routine. The computer is in control of tasking, and it "finks" to the supervisor at the touch of a button on any number of work-related matters.

As for the young analysts, he/she enjoys considerable freedom. The extent of VDT use varies widely from day to day. The system is viewed as a tool, not a master. No two days of work are ever the same. Does it really matter that the chair violates every ergonomic principle in the handbook; or that the screen is too high or low, near or far for someone who won't be sitting there 10 minutes from now? And what can the supervisor really learn about the analyst's overall productivity by keeping tabs on computer usage?

The intended thrust of this paper is to reinforce the view that workstation uniformity may not be the direction in which the Agency should go. Unique as well as common needs of the several types of anticipated users must be factored into the design of the system of the future.

And just as importantly, when workstations are mentioned, more is being talked about than the system hardware and software. Furniture, environmental factors, job content, user perspectives -- these and a number of other factors have been shown to have a measurable impact on the manner in which automated systems are accepted and how successfully they are used. They deserve their share of consideration.

TABLE 1

HUMAN FACTORS CONSIDERATIONS FOR THE DESIGN AND IMPLEMENTATION OF THE PROPOSED WSEWG WORD AND DATA PROCESSING WORKSTATION

1. Anthropometric Design

    a. Workstation Surface
        (1) Height
        (2) Width
        (3) Depth
    b. Workstation Knee Room
        (1) Height
        (2) Width
        (3) Depth
    c. Home Row Height (from floor)
    d. Keyboard Thickness
    e. Detachable Keyboard
    f. Keyboard Slope
    g. Viewing Distance
    h. Chair Adjustment Design

2. Workstation Design Characteristics

    a. Tiltable Display
    b. Screen Angle
    c. Screen Location
    d. Screen Size

3. Design of Keys

    a. Keystroke
    b. Key Force
    c. Key Travel
    d. Key Spacing
    e. Key Surface
    f. Keytop Dimension (Top Surface)
    g. Keyboard Layout

4. Display Image Characteristics

    a. Alphanumeric
    b. Image
    c. Combined
        (1) Phosphor
        (2) Polarity
        (3) Distortions
        (4) Refresh Rate
        (5) Preferred Color
        (6) Number of Colors
        (7) Multi-Colors/Color Contrast

5. Display Characteristics

    a. Alphanumeric
    b. Image
    c. Combined
        (1) Character Format
        (2) Character Size
        (3) Dot Size/Dot Spacing
        (4) Line Spacing
        (5) Character/Word Spacing
        (6) Blink Rate

6. Lighting and Reflectance

    a. Alphanumeric
    b. Image
    c. Combined
        (1) Luminance Levels
        (2) Luminance Distribution
        (3) Glare Control
        (4) Symbol Luminance
        (5) Symbol Contrast
        (6) Adjustments/Controls

7. Heating/Ventilation/Air Conditioning

    a. Humidity
    b. Temperature
    c. Air Velocity (drafts)
    d. Seasonal Influences
    e. Clothing
    f. Individual Tolerances

8. Occupational Stress/Psychosocial Issues/Worker Satisfaction

    a. Demographics
        (1) Age
        (2) Sex
        (3) Ethnic Background
        (4) Education
        (5) Marital Status
        (6) Tenure
            (a) Employer
            (b) Job Category
    b. Occupational Categories
        (1) VDT Operator
            (a) Professional
            (b) Clerical
            (c) Data Entry/Retrieval
        (2) Non VDT Operator
            (a) Professional
            (b) Clerical
            (c) Data Entry/Retrieval

c. Sources of Stress
   (1) Job
   (2) Career
   (3) Health
   (4) Involvement
   (5) Peer Cohesion
   (6) Staff Support
   (7) Autonomy
   (8) Work Pressure
   (9) Supervisory Control
   (10) Workload
   (11) Boredom
   (12) Role Ambiguity
   (13) Quantitative Workload
   (14) Lack of Self Esteem
   (15) Job Future Ambiguity
   (16) Mood Disturbances
   (17) Full-Time vs. Part-Time VDT Operation

9. Health Complaints

a. Demographics
   (1) Age
   (2) Sex
   (3) Ethnic Background
   (4) Education
   (5) Marital Status
   (6) Tenure
      (a) Employer
      (b) Job Category

b. Occupational Categories
   (1) VDT Operator
      (a) Professional
      (b) Clerical
      (c) Data Entry/Retrieval
   (2) Non VDT Operator
      (a) Professional
      (b) Clerical
      (c) Data Entry/Retrieval

c. General Areas
   (1) Visual
   (2) Musculoskeletal
   (3) Emotional/Fatigue

d. Sources
   (1) Workstation Design
   (2) Computer System
   (3) Job

10. Radiation/Industrial Hygiene

    a. VDT, Make and Model
    b. Radiation
        (1) Ionizing
        (2) Near UV
        (3) Visible
        (4) Radiofrequency
            (a) Electric Field
            (b) Magnetic Field
    c. Airborne Chemicals

11. Acoustics

    a. Speech Privacy Requirements
        (1) Confidential
        (2) Normal
        (3) Minimal
    b. Acoustical Specifications
        (1) Walls
        (2) Ceilings
        (3) Screens
        (4) Vertical Surfaces
        (5) Floors
        (6) Wall Hangings
        (7) Background Masking

12. Training

    a. Requirements
        (1) Novice
        (2) New Systems
        (3) Upgrades
    b. Solutions
        (1) Initial Training
        (2) Maintenance Training
        (3) Quality Control

13. Job Performance

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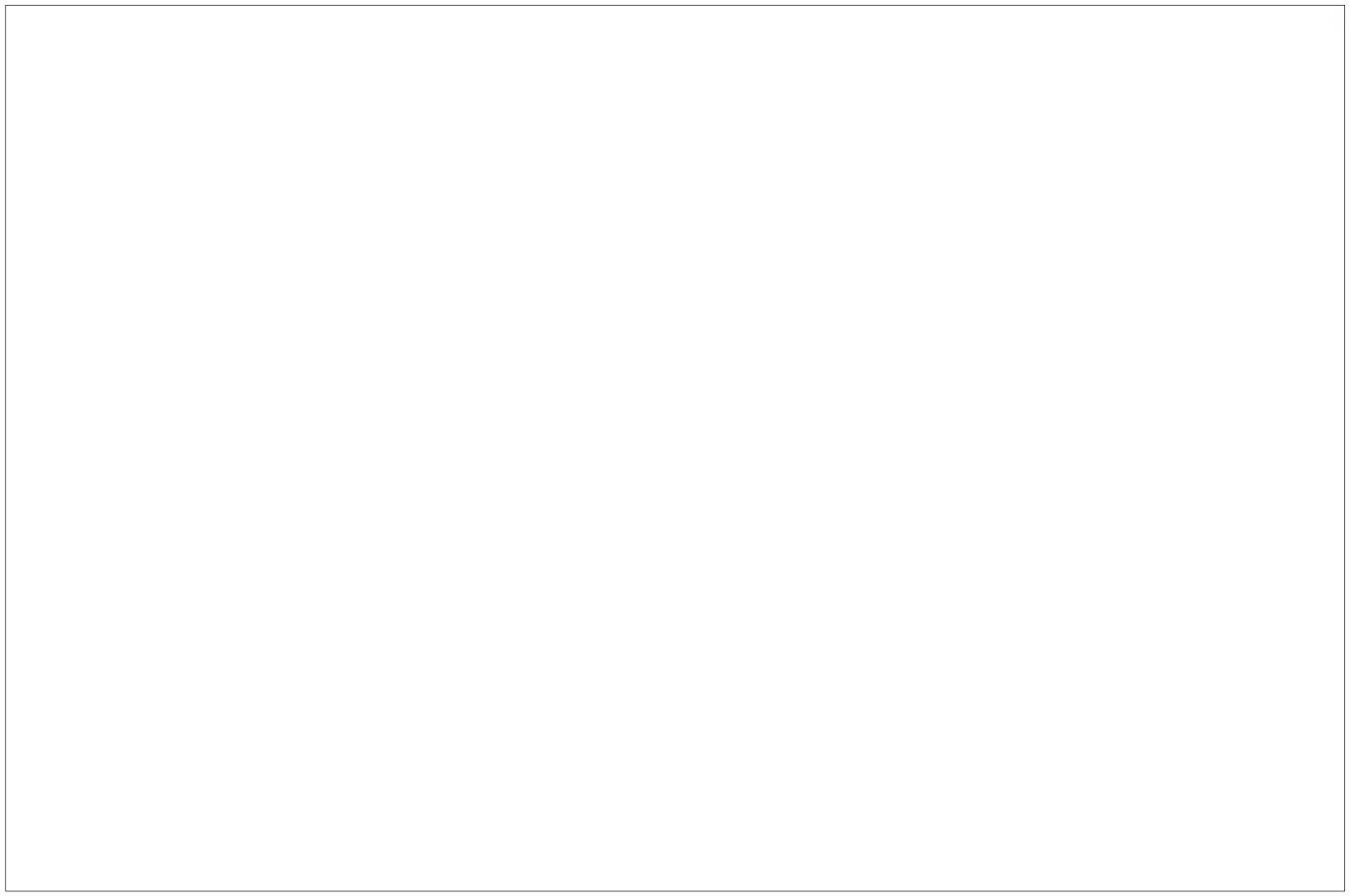
APPENDIX B3 (Continued)

PERSONAL COMPUTERS PROCURED BY CIA, FISCAL YEARS 1982-1983

25X1



Note: Excluding the PC units owned by ODP and the Delta Data (DD) units which are acquired and managed by ODP, the list represents external procurements which were forwarded for the D/ODP's concur-
25X1 rence as per [redacted] The Delta Data units may also function as terminals as well as local PCs.

These external procurement data cover fiscal years 1982 and 1983 (through 15 October 1983). The Delta Data and ODP-owned PC information has been verified. However, the remaining data represent only those procurement requests which were routed through ODP. Since there were relatively few end users considering PCs to defeat application backlogs in FY-82, and OL began to tighten its controls in FY-83 to insure that procurement instruments for ADP equipment contained D/ODP's concurrence, the data in this table are considered to be a valid approximation to the actual PC procurement picture.

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